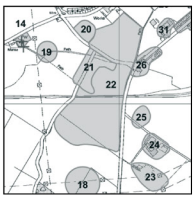
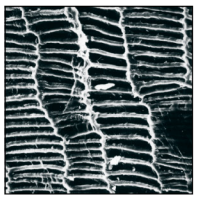
LSRA17










LAND AT STATION ROAD, ASHWELL, HERTFORDSHIRE

GEOPHYSICAL SURVEY

commissioned by Archaeology Collective
on behalf of Beck Homes (UK) Limited

December 2017

HEADLAND ARCHAEOLOGY

REGISTERED ORGANISATION CIfA

LAND AT STATION ROAD, ASHWELL, HERTFORDSHIRE

GEOPHYSICAL SURVEY

commissioned by Archaeology Collective
on behalf of Beck Homes (UK) Limited

December 2017

This report adheres to the quality standard of ISO 9001:2008

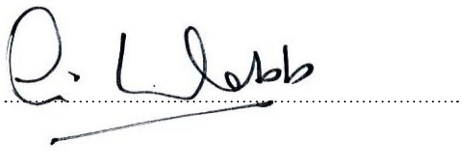
PROJECT INFO:

HA Project Code **LSRA17** / NGR **TL 2779 3970** / Parish **Ashwell** / Local Authority **Hertfordshire County Council** / OASIS Ref. **headland5-304503**

PROJECT TEAM:

Project Manager **Alistair Webb** / Author **David Harrison** / Fieldwork **Kevin Heaton, Ross Bishop** / Graphics **Beata Wieczorek-Oleksy, Caroline Norrman, David Harrison**

Approved by **Alistair Webb**



Headland Archaeology North
Unit 16 | Hillside | Beeston Rd | Leeds LS11 8ND
t 0113 387 6430
e north@headlandarchaeology.com
w www.headlandarchaeology.com

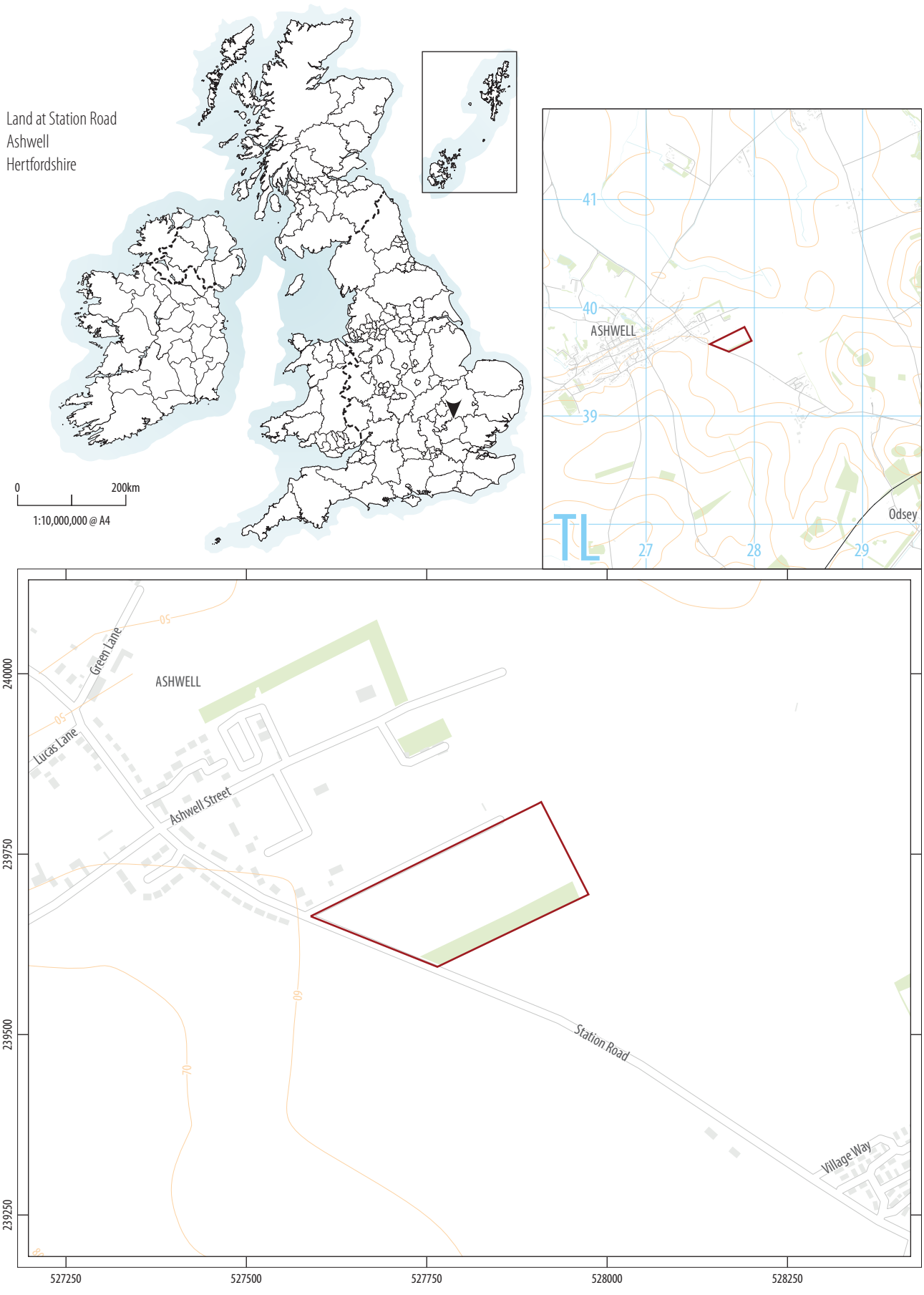
HEADLAND ARCHAEOLOGY

PROJECT SUMMARY

Headland Archaeology (UK) Ltd, undertook a geophysical (magnetometer) survey covering approximately 4 hectares, within a single field south-east of Ashwell, Hertfordshire, to inform planning proposals for a residential and recreational development. The field is located in a rich archaeological landscape, as detailed in an Archaeological Desk Based Assessment, with a particularly high potential for encountering ploughed-down Bronze Age burial mounds. No anomalies of clear archaeological potential have been detected by the survey and none to suggest the presence of any funerary activity. However, a possible trackway has been identified in the north-east of the field defined by parallel linear ditches. West of the possible trackway two extremely high magnitude anomalies have been identified which do not correspond to any surface features nor to any features shown on historical mapping. The anomalies may by modern in origin but an archaeological origin cannot be dismissed and they may locate an area of industrial activity, perhaps kilns. Elsewhere, a single high magnitude anomaly in the west of the site may be of interest, perhaps being caused by an isolated pit. Ridge and furrow anomalies across the western half of the site attest to the former agricultural landscape. Therefore, on the basis of the geophysical survey, the majority of the site is assessed as having a low archaeological potential with the exception of the possible trackway and area of possible industrial activity which are ascribed a moderate archaeological potential.

CONTENTS

LIST OF ILLUSTRATIONS



HEADLAND ARCHAEOLOGY
Headland Archaeology North
Unit 16 | Hillside | Beeston Rd | Leeds LS11 8ND
t 0113 387 6430
e north@headlandarchaeology.com
w www.headlandarchaeology.com

ILLUS 1 Site location

LAND AT STATION ROAD, ASHWELL, HERTFORDSHIRE

GEOPHYSICAL SURVEY

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by Archaeology Collective (the consultant), to undertake a geophysical (magnetometer) survey of land to the south-east of Ashwell, Hertfordshire, where Beck Homes (UK) Limited propose a residential and recreational development (see Illus 1).

The work was undertaken in accordance with a Written Scheme of Investigation (Harrison, 2017) submitted to, and approved by Dr Simon Wood, Historic Environment Advisor at Hertfordshire County Council, and with guidance contained in the National Planning Policy Framework (DCLG 2012). All work was undertaken in line with current best practice (Chartered Institute for Archaeologists 2014, English Heritage 2008).

The survey was carried out on December 5th 2017.

1.1 SITE LOCATION, LAND-USE AND TOPOGRAPHY

The proposed development area (PDA) occupies a single rectangular field together with a stand of trees along its south-eastern boundary, and is centred at TL 2779 3970. It is bound to the west by Station Road, by a farm track to the north and by arable farmland to the south and east. At the time of the survey the field was under a young cereal crop (see Illus 2).

The village of Ashwell and the PDA lie on the edge of a spur of the Chiltern escarpment at approximately 54m Above Ordnance Datum (AOD). Locally the topography rises from 52.5m AOD in the centre of the field to 57m in the north-west and 56m in the east.

1.2 GEOLOGY AND SOILS

The underlying bedrock geology consists of Zig Zag Chalk. A superficial band of Head (clay, silt, sand and gravel) is recorded north/south across the centre of the field (see Illus 3; NERC 2017).

The soils are mainly classified in the Soilscape 5 association, characterised as freely draining lime-rich loams but with shallow lime-rich soils (classified in the Soilscape 3 association) recorded in the west of the field (Cranfield University 2017).

2 ARCHAEOLOGICAL BACKGROUND

An Archaeological Desk-Based Assessment (Archaeology Collective 2017) has concluded that the PDA has a high potential for the presence of remains of Bronze Age burial mounds and a medium potential for remains from later prehistoric and Roman periods. Based on results from previous archaeological works in close proximity to the PDA, there is considered to be a low potential for remains from the Saxon period and negligible potential for all other periods.

Analysis of historical Ordnance Survey (OS) mapping indicates that the division of land within the PDA has remained unchanged over the last 140 years apart from the removal of a single north/south field boundary in the east of the field (see Illus 3).

3 AIMS, METHODOLOGY AND PRESENTATION

The general aim of the geophysical survey was to provide sufficient information to establish the presence/absence, character and extent of any archaeological remains within the survey area. This will therefore

ILLUS 2 Survey area, looking south-west

enable an assessment to be made of the impact of the proposed development on any sub-surface archaeological remains, if present.

The specific archaeological objectives of the geophysical survey were:

- to provide information about the nature and possible interpretation of any magnetic anomalies identified;
- to therefore model the presence/absence and extent of any buried archaeological features; and
- to prepare a report summarising the results of the survey.

3.1 MAGNETOMETER SURVEY

Magnetic survey methods rely on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. A feature such as a ditch, pit or kiln can act like a small magnet, or series of magnets, that produce distortions (anomalies) in the earth's magnetic field. In mapping these slight variations, detailed plans of sites can be obtained as buried features often produce reasonably characteristic anomaly shapes and strengths (Gaffney & Gater 2003). Further information on soil magnetism and the interpretation of magnetic anomalies is provided in Appendix 1.

The survey was undertaken using four Bartington Grad601 sensors mounted at 1m intervals (1m traverse interval) onto a rigid carrying frame. The system was programmed to take readings at a frequency of 10Hz (allowing for a 10-15cm sample interval) on roaming traverses (swaths) 4m apart. These readings were stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system was linked to a Trimble R8s Real Time Kinetic (RTK) differential Global Positioning System (dGPS) outputting in NMEA mode to ensure a high positional accuracy for each data point.

MLGrad601 and MultiGrad601 (Geomar Software Inc.) software was used to collect and export the data. Terrasurveyor V3.0.32.4 (DWConsulting) software was used to process and present the data.

3.2 REPORTING

A general site location plan is shown in Illus 1 at a scale of 1:7,500. Illus 2 is a site condition photograph. Illus 3 is a 1:3,000 scale survey location plan showing the GPS swaths and superficial deposits overlying the 1888–1913 six inch OS map. The fully processed (greyscale) data, minimally processed data (greyscale and XY traceplot) and an accompanying interpretative plot are presented at a scale of 1:1,250 in Illus 4 to 7 inclusive.

Technical information on the equipment used, data processing and magnetic survey methodology is given in Appendix 1. Appendix 2

details the survey location information and Appendix 3 describes the composition and location of the site archive. Data processing details are presented in Appendix 4. A copy of the OASIS entry (Online Access to the Index of Archaeological Investigations) is reproduced in Appendix 5.

The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Harrison 2017) and guidelines outlined by Historic England (English Heritage 2008) and by the Chartered Institute for Archaeologists (CIfA 2014). All illustrations from Ordnance Survey mapping are reproduced with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

The illustrations in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All illustrations are presented to most suitably display and interpret the data from this site based on the experience and knowledge of management and reporting staff.

4 RESULTS AND DISCUSSION

The ground conditions across the PDA were very good (see Illus 2) and consequently the overall quality of the data collected was good throughout.

The survey has detected a moderate level of magnetic background characterised by a plethora of discrete anomalies. Against this background, several anomalies have been identified. These are discussed below and cross-referenced to specific anomalies on the interpretative drawings, where appropriate.

4.1 FERROUS AND MODERN ANOMALIES

Ferrous anomalies, characterised as individual 'spikes', are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris is common on most sites, often being present as a consequence of manuring or tipping/infilling. There is no obvious clustering to these ferrous anomalies which might indicate an archaeological origin. Far more probable is that the 'spike' responses are likely caused by the random distribution of ferrous debris in the upper soil horizons. Two spikes of particularly high magnitude (F1 and F2; see Illus 7) are noted in the east of the field.

Magnetic disturbance around the field edge is due to ferrous material within or close to the adjacent field boundaries, and is of no archaeological interest.

4.2 MODERN?/INDUSTRIAL? ANOMALIES

Two extremely high magnitude anomalies (K1 and K2; see Illus 7) are clearly visible within the east of the field. The anomalies cannot be explained by any surface features nor do they correspond to any features shown on historical OS maps. Whilst it is possible that they are caused by modern debris within the topsoil, an archaeological origin cannot be dismissed. It is possible that the anomalies are caused by burnt material, perhaps associated with kilns. A number of lime kilns are recorded in the vicinity of Ashwell on historical OS maps and on the Hertfordshire HER, the closest to the PDA being 500m to the west. An area of increased background response extends northwards from the anomalies, probably being caused by a spread of magnetically-enhanced material.

4.3 AGRICULTURAL ANOMALIES

Analysis of historic OS mapping indicates that a single field boundary was removed from within the PDA between 1960 and 1975 (see Illus 3). This boundary has not been detected by the survey. The reason for this is not clear, but it is thought more likely that it has been completely removed by subsequent ploughing activity rather than there being a lack of magnetic contrast in the prevailing soils. A series of faint parallel linear trends aligned north-west/south-east throughout the western half of the field are characteristic of the medieval and post-medieval practice of ridge and furrow cultivation.

4.4 GEOLOGICAL ANOMALIES

The data is dominated by discrete anomalies and faint curving trends which are caused by variation in the depth and composition of the soils and the chalk bedrock from which they derive. A sinuous band of magnetic enhancement (GV1; see Illus 7) aligned north/south within the centre of the field follows the 53m contour and corresponds to the superficial deposit of Head (clay, silt, sand and gravel) recorded by the British Geological Survey (see Illus 3).

4.5 POSSIBLE ARCHAEOLOGICAL ANOMALIES

Parallel linear anomalies (D1 and D2; see Illus 7) are clearly visible within the east of the PDA on a north-west/south-east orientation, oblique to the extant and historical field boundaries. The anomalies are approximately 13m apart and are thought to be due to soil-filled ditches. It is possible that the ditches flank the route of a trackway, the surface of which may be defined by a band of magnetic enhancement, TR1.

Within the west of the field an isolated high magnitude anomaly (P1; see Illus 7) is visible. The anomaly is notable for its high magnitude and may be caused by a soil-filled pit, although a geological origin is equally plausible.

5 CONCLUSION

The survey has successfully evaluated the PDA revealing anomalies reflecting the site's agricultural past as well as variation in the underlying soils and geology. No anomalies of definite archaeological potential have been detected by the survey and none which suggest the presence of Bronze Age burial mounds or any other funerary activity. However, a possible trackway has been identified

in the east of the site flanked by two parallel ditches. West of the possible trackway two extremely high magnitude anomalies have been identified which do not correspond to any surface features nor to any features shown on historical mapping. The anomalies may by modern in origin but an archaeological origin cannot be dismissed and they may locate an area of industrial activity, perhaps kilns. A number of lime kilns are known 500m to the east of PDA in the village of Ashwell. Elsewhere, a single high magnitude anomaly in the west of the site may be of interest, perhaps being caused by an isolated pit. Therefore, on the basis of the geophysical survey, the majority of the site is assessed as having a low archaeological potential with the exception of the possible trackway and area of possible industrial activity which are ascribed a moderate archaeological potential.

6 REFERENCES

Archaeology Collective 2017 ***Archaeological Desk Based Assessment: Land at Station Road, Ashwell, Hertfordshire*** [unpublished client document] Ref AC00378A

Chartered Institute for Archaeologists (CIfA) 2014 ***Standard and guidance for archaeological geophysical survey*** (Reading) http://www.archaeologists.net/sites/default/files/CIfAS&GGeophysics_1.pdf accessed 15 December 2017

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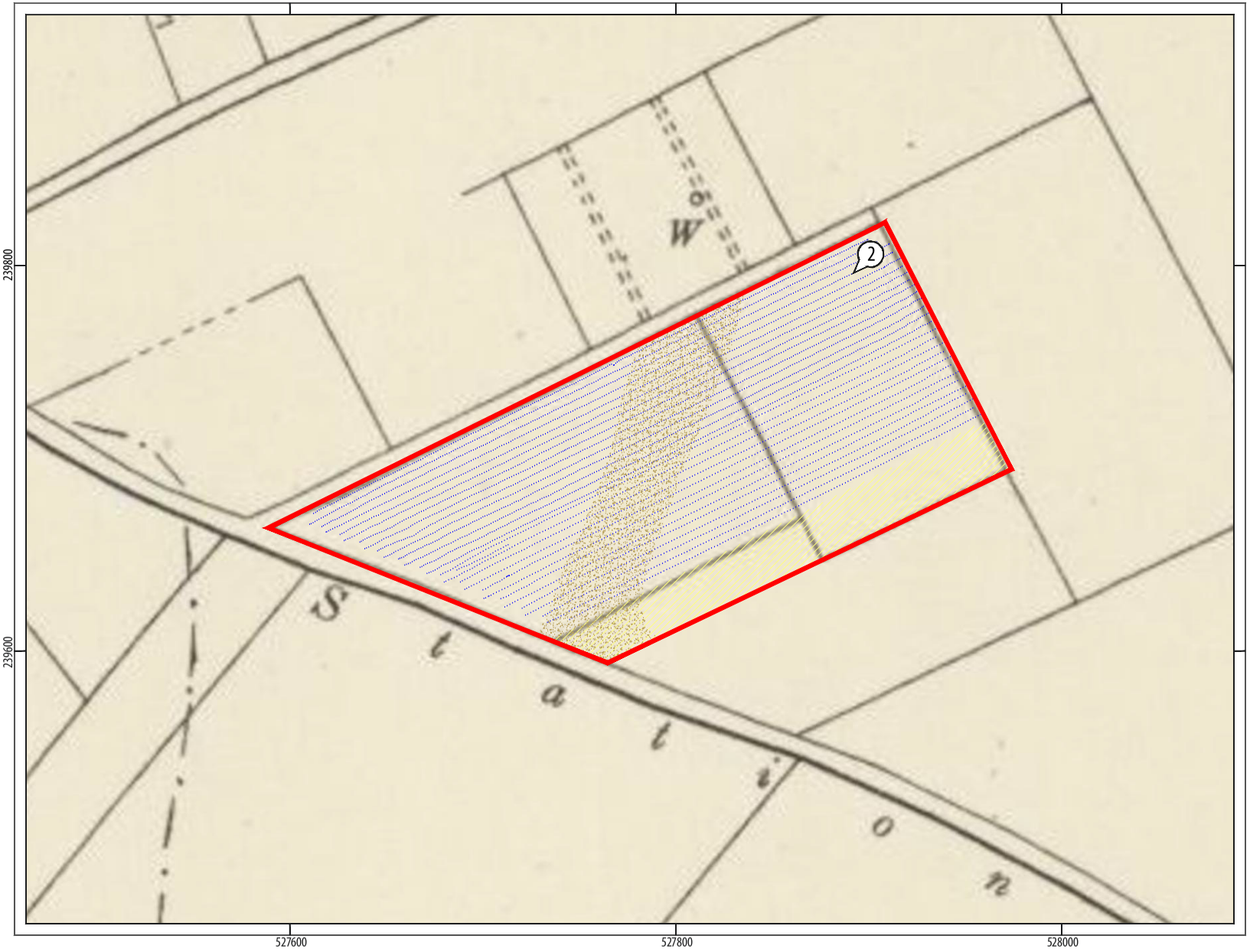
Gaffney C & Gater J 2003 ***Revealing the Buried Past: Geophysics for Archaeologists*** Stroud

Harrison D 2017 ***Land at Station Road, Ashwell, Hertfordshire: Written Scheme of Investigation for Geophysical Survey*** [unpublished client document] Headland Archaeology, Ref LSRA17

Natural Environment Research Council (NERC) 2017 ***British Geological Survey*** http://www.bgs.ac.uk/ accessed 15 December 2017



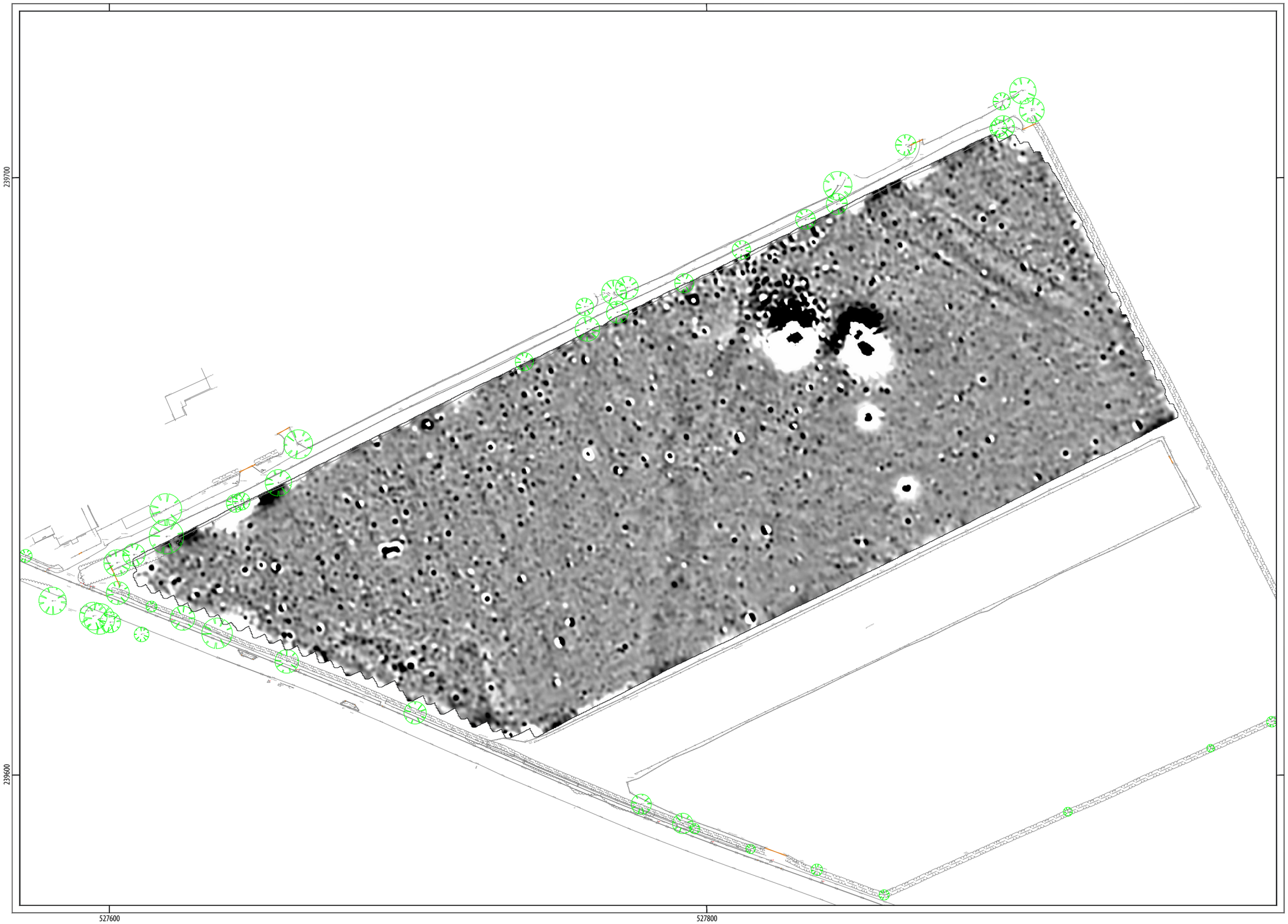
proposed development area
location and direction of ILLUS 2
area unsuitable for survey
GPS swaths
Head - clay, silt, sand and gravel

0 50m
1:3,000 @ A4

PROJECT LSRA17
Land at Station Road
Ashwell
Hertfordshire
CLIENT Archaeology Collective

HEADLAND ARCHAEOLOGY
NORTH Unit 16, Hillside, Beeston Road
Leeds LS11 8ND
0113 387 6430
www.headlandarchaeology.com

ILLUS 3 Survey location showing GPS swaths and superficial deposits overlying the 1888-1913 six inch OS map (1:3,000)



-2.0 nT 3.0

0 25m
1:1,250 @ A3

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Hertfordshire

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HEADLAND ARCHAEOLOGY
NORTH Unit 16, Hillside, Beeston Road
Leeds LS11 8ND
0113 387 6430
www.headlandarchaeology.com

ILLUS 4 Processed greyscale magnetometer data (1:1,250)

239700

239600

527600

527800

nT
-2.0
3.0

0
25m
1:1,250 @ A3

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NORTH Unit 16, Hillside, Beeston Road
Leeds LS11 8ND
0113 387 6430
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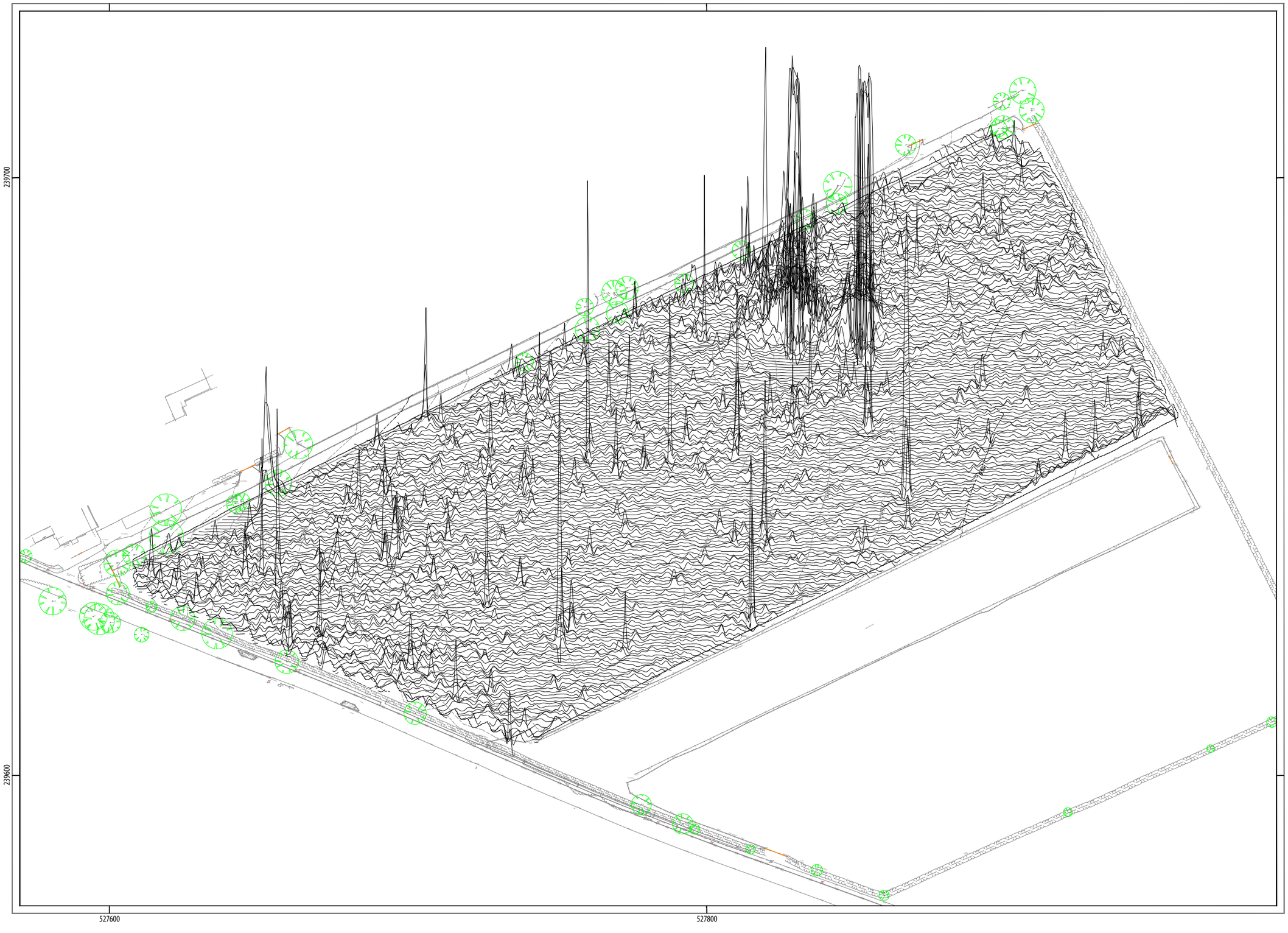
ILLUS 5 Minimally processed greyscale magnetometer data (1:1,250)



10.0nT/cm

0 25m

1:1,250 @ A3

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Hertfordshire

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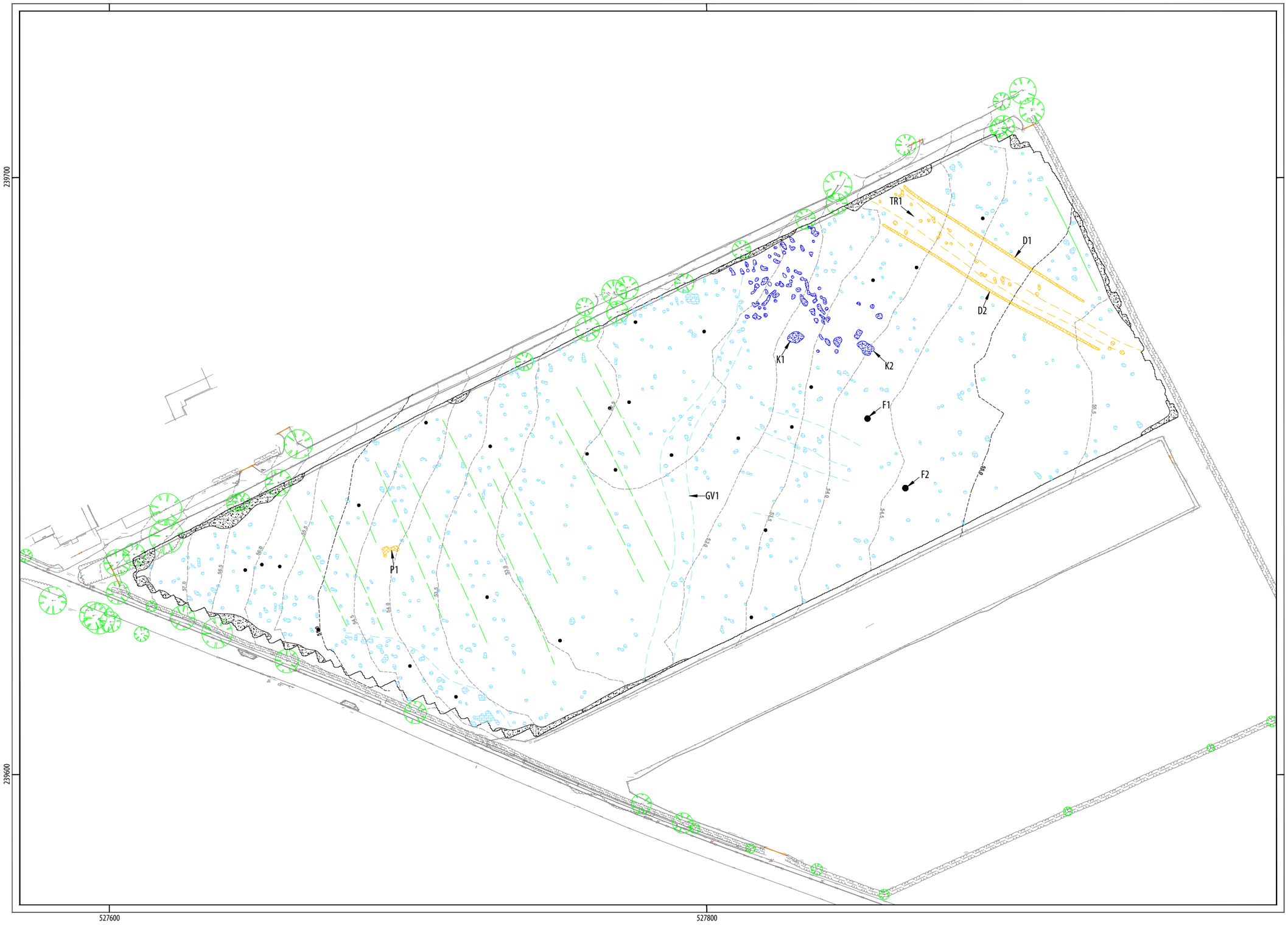
NORTH Unit 16, Hillside, Beeston Road
Leeds LS11 8ND
0113 387 6430
www.headlandarchaeology.com

ILLUS 6 XY trace plot of minimally processed magnetometer data (1:1,250)



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic disturbance	modern?/industrial?
linear trend	ridge and furrow
linear trend	agricultural
linear	geological variation
magnetic enhancement	geology?
linear	archaeology?
magnetic enhancement	archaeology?

ABBREVIATIONS

D	ditch
F	ferrous
GV	geological variation
K	kiln?
P	pit?
TR	trackway?

0 25m
1:1,250 @ A3

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NORTH Unit 16, Hillside, Beeston Road
Leeds LS11 8ND
0113 387 6430
www.headlandarchaeology.com

ILLUS 7 Interpretation of magnetometer data showing 0.5m contour data (1:1,250)

7 APPENDICES

APPENDIX 1 MAGNETOMETER SURVEY

Magnetic susceptibility and soil magnetism

Iron makes up about 6% of the earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haematite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms so that by measuring the magnetic susceptibility of the topsoil, areas where human occupation or settlement has occurred can be identified by virtue of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected.

The magnetic susceptibility of a soil can also be enhanced by the application of heat. This effect can lead to the detection of features such as hearths, kilns or areas of burning.

Types of magnetic anomaly

In the majority of instances anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

Isolated dipolar anomalies (iron spikes) These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic 'spiky' trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

Areas of magnetic disturbance These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

Linear trend This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

Areas of magnetic enhancement/positive isolated anomalies Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response (sometimes only visible on an XY trace plot) on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an 'iron spike' anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often therefore be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

Linear and curvilinear anomalies Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

APPENDIX 2 SURVEY LOCATION INFORMATION

An initial survey base station was established using a Trimble VRS differential Global Positioning System (dGPS). The magnetometer data was georeferenced using a Trimble RTK differential Global Positioning System (Trimble R8s model).

Temporary sight markers were laid out using a Trimble VRS differential Global Positioning System (Trimble R8s model) to guide the operator and ensure full coverage. The accuracy of this dGPS equipment is better than 0.01m.

The survey data were then super-imposed onto a base map provided by the client to produce the displayed block locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if coordinates are measured off hard copies of the mapping rather than using the digital coordinates.

Headland Archaeology cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

APPENDIX 3 GEOPHYSICAL SURVEY ARCHIVE

The geophysical archive comprises an archive disk containing the raw data in XYZ format, a raster image of each greyscale plot with associate world file, and a PDF of the report.

The project will be archived in-house in accordance with recent good practice guidelines (http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_3). The data will be stored in an indexed archive and migrated to new formats when necessary.

APPENDIX 4 DATA PROCESSING

The gradiometer data has been presented in this report in processed greyscale, minimally processed greyscale and minimally processed XY trace plot format.

Data collected using RTK GPS-based methods cannot be produced without minimal processing of the data. The minimally processed data has been interpolated to project the data onto a regular grid and de-striped to correct for slight variations in instrument calibration drift and any other artificial data (no de-striping has been applied to the minimally processed greyscale data). The XY trace data has also been clipped to remove extreme values and to improve data contrast.

The processed data has also been interpolated to project the data onto a regular grid. A high pass filter has been applied to the greyscale plots to remove low frequency anomalies (relating to survey tracks and modern agricultural features) in order to maximise the clarity and interpretability of the archaeological anomalies.

APPENDIX 5 OASIS DATA COLLECTION FORM: ENGLAND

OASIS ID: headland5-304503

Project details	
Project name	Land at Station Road, Ashwell, Hertfordshire
Short description of the project	Headland Archaeology (UK) Ltd, undertook a geophysical (magnetometer) survey covering approximately 4 hectares, within a single field south-east of Ashwell, Hertfordshire, to inform planning proposals for a residential and recreational development. The field is located in a rich archaeological landscape, as detailed in an Archaeological Desk Based Assessment, with a particularly high potential for encountering ploughed-down Bronze Age burial mounds. No anomalies of clear archaeological potential have been detected by the survey and none to suggest the presence of any funerary activity. However, a possible trackway has been identified in the north-east of the field defined by parallel linear ditches. West of the possible trackway two extremely high magnitude anomalies have been identified which do not correspond to any surface features nor to any features shown on historical mapping. The anomalies may by modern in origin but an archaeological origin cannot be dismissed and they may locate an area of industrial activity, perhaps kilns. Elsewhere, a single high magnitude anomaly in the west of the site may be of interest, perhaps being caused by an isolated pit. Ridge and furrow anomalies across the western half of the site attest to the former agricultural landscape. Therefore, on the basis of the geophysical survey, the majority of the site is assessed as having a low archaeological potential with the exception of the possible trackway and area of possible industrial activity which are ascribed a moderate archaeological potential.
Project dates	Start: 05-12-2017 End: 05-12-2017
Previous/future work	Not known / Not known
Any associated project reference codes	LSRA17 - Contracting Unit No.
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	N/A None
Monument type	N/A None
Significant Finds	N/A None
Significant Finds	N/A None
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Pre-application
Solid geology	CHALK (INCLUDING RED CHALK)
Drift geology	COLLUVIUM
Techniques	Magnetometry
Project location	
Country	England
Site location	HERTFORDSHIRE NORTH HERTFORDSHIRE ASHWELL Land at Station Road, Ashwell
Study area	4 Hectares
Site coordinates	TL 2779 3970 52.040516563861 -0.136601183001 52 02 25 N 000 08 11 W Point
Project creators	
Name of Organisation	Headland Archaeology
Project brief originator	Archaeology Collective
Project design originator	Headland Archaeology
Project director/manager	Webb, A.
Project supervisor	Bishop, R

Type of sponsor/funding body	Developer
Project archives	
Physical Archive Exists?	No
Digital Archive recipient	In house
Digital Contents	"Survey"
Digital Media available	"Geophysics"
Paper Archive Exists?	No
Project bibliography 1	
Publication type	Grey literature (unpublished document/manuscript)
Title	Land at Station Road, Ashwell, Hertfordshire; Geophysical Survey
Author(s)/Editor(s)	Harrison, D.
Date	2017
Issuer or publisher	Headland Archaeology
Place of issue or publication	Leeds
Description	A4 comb-bound report
Entered by	David Harrison (david.harrison@headlandarchaeology.com)
Entered on	19 December 2017

Headland Archaeology South & East
Building 68C | Wrest Park | Silsoe | Bedfordshire MK45 4HS
t 01525 861 578
e southandeast@headlandarchaeology.com

Headland Archaeology Midlands & West
Unit 1 | Clearview Court | Twyford Rd | Hereford HR2 6JR
t 01432 364 901
e midlandsandwest@headlandarchaeology.com

Headland Archaeology North
Unit 16 | Hillside | Beeston Rd | Leeds LS11 8ND
t 0113 387 6430
e north@headlandarchaeology.com

Headland Archaeology Scotland
13 Jane Street | Edinburgh EH6 5HE
t 0131 467 7705
e scotland@headlandarchaeology.com

www.headlandarchaeology.com